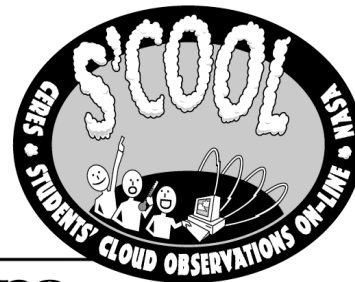




S'COOL BREEZE



Student's Cloud Observations On-Line

Volume 3, Issue 6

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Why Does NASA Have Its Head in the Clouds?

By Dr. Shelley Canright, NASA Headquarters

Clouds are more than just funny shapes or pretty pictures. They also play a critical role in the Earth's energy and water cycles, and thus the Earth's climate.



This picture shows a low hanging cloud under a cumulonimbus cloud with an updraft

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How do clouds affect climate? This can be difficult to determine exactly. For example, during the day clouds block sunlight from reaching the ground. This produces a cooling effect. But at night they prevent heat from escaping to space, producing a warming effect. To make things more complicated, not all clouds behave the same. High clouds affect temperature differently than low clouds, and thick storm clouds affect temperature differently than thin clouds.

Understanding clouds is important to predicting how Earth's climate will change in the future. One of the biggest sources of uncertainty in the computer programs that predict climate is the effects of clouds.

(Continued on page 2)

A Portrait for an Amateur Meteorologist

By Roberto Sepulveda, CERES S'COOL Team
Special thanks to Dr. David Duda, NASA Langley



Luke Howard, the father of Cloud Classification

You would have probably never guessed that Luke Howard, inventor of the modern day Latin-based cloud classification system, had little passion for the Latin language. Luckily for us, his childhood passion for weather was compelling enough to produce a life-long interest in clouds. In this article, we have departed from the usual cloud photographs, which are easily available from our S'COOL gallery of clouds, and adopted the images drawn by Luke Howard (courtesy of Cloudman.com) to create a nostalgic mood as we take a look at some facts that will serve an amateur meteorologist well in the field.



A painting by Luke Howard showing an Anvil Cloud

Cumulonimbus clouds (seen here on the left) are considered the tallest multi-layered clouds because they span all cloud layers and can extend above 60,000 feet. They are most common in warm and humid locations during spring and summer. These clouds can produce lightning, thunder, heavy rain, hail, strong winds and tornadoes and thus are better known as 'thunderstorm clouds' or 'Thunderheads.' The anvil-shaped top is a characteristic seen with these clouds and forms because of stronger winds at the higher levels of the atmosphere. Because these clouds are associated with many forms of precipitation, Luke Howard used the Latin root 'nimbus' (meaning rain) to name these clouds.

(Continued on page 3)



Waterspout funnels dropping from clouds in the Virgin Islands

That's why NASA launches satellites into space to specifically study clouds. Some of these satellites simply take pictures of clouds. Others send invisible pulses into the clouds to measure traits such as cloud thickness or water content

An instrument called CERES is on several NASA satellites orbiting Earth. CERES stands for Clouds and the Earth's Radiant Energy System. It measures the amount of energy reflected and given off by clouds at different heights. This information is used to improve climate forecasts made by computers.

But satellite measurements aren't always accurate. That's why NASA started the S'COOL program, or Students' Cloud Observations On-line. Participants are K-12 students who are helping NASA scientists calibrate CERES instruments. NASA scientists then compare the satellite measurements from space with what students see from the ground. This way the scientists can judge the instrument's performance and make any necessary adjustments.

Quarter's Worth of Websites

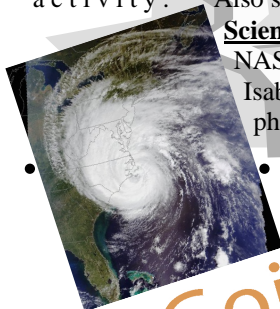
The Space Place Cloud Scrambler: http://spaceplace.jpl.nasa.gov/cloudsat_puz.htm

For those of you that have been keeping track of our quarterly websites, this will be no surprise. We just thought we couldn't pass up the opportunity to let you in on this great activity for kids. Try it and you will surely be entertained as you drag the misplaced pieces of the cloud picture to where you think they belong in the "Unscramble the Cloud" activity. Also see what neat 'Goodies' are available for teachers and order your 2004 Space Place calendar.



Science @ NASA: Hurricane Isabel: http://science.nasa.gov/headlines/y2003/18sep_isabel.htm?list763783

NASA's Terra and Aqua satellites were busy at work taking beautiful pictures just as the heart of Hurricane Isabel was making landfall. Visit Science @ NASA at: <http://science.nasa.gov/headlines/> and see more space photos. While you're there, sign up for their mailing list and receive headline stories as soon as they're printed.



Going Through the Loop Plans Lesson



Cloudy Days are for Reading and Writing

Objective: Students will use critical thinking skills of analysis and evaluation to determine the scientific validity of weather proverbs and present the reasoning in essay form.

Type of Activity: Extension **Suggested Grade Level:** 6-8 (adaptable to other grade levels)

Vocabulary: Proverb, Forecast, Validate, Precipitation, Prediction, Theorize, Folklore, Histogram

Materials: Pen, Paper, Earth Science Text, Nonfiction books on Weather and Weather Proverbs or Folklore (ex: Meider, Wolfgang, "Proverbs," *Encyclopedia of Climate and Weather*, 1996)

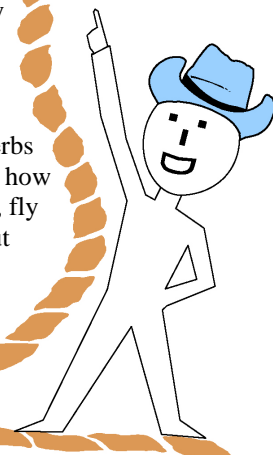
Background: Man's preoccupation with weather has been well documented throughout history. We can follow this obsession through our earliest myths and histories into the 20th century in the ways in which humans have sought to understand, predict, and control the weather. The concept is reflected in the English sailing proverb: "Red sky at night, sailor's delight; Red sky in the morning, sailors take warning." (Schneider, 1996)

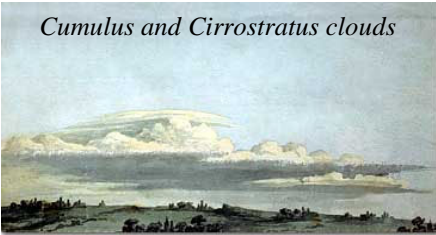
Lesson Activity: Choose three American Weather Proverbs from the list provided and thoughtfully consider: 1. Do you think the proverb has any scientific validity? 2. What atmospheric conditions might make the object/animal react in this way? 3. Were these proverbs useful in the past? 4. Develop a theory about the proverb. 5. Construct a histogram to show how many folks have heard each proverb. (Example Proverbs: A. Geese and other migrating birds, fly higher in fair weather than in foul. B. The higher the clouds the better the weather. Check out NASA STEMS on page 3 for more thought provoking proverbs.)

Teacher Notes: Some helpful hints are provided for the validity of the proverbs.

Complete Lesson Plan available at:

http://asd-www.larc.nasa.gov/SCOOL/lesson_plans/Cloudy_Days.html





Cumulus and Cirrostratus clouds

Nimbostratus clouds, as the name implies, are also precipitating clouds. They are considered multi-layered clouds because their tops often extend into the middle cloud level.

Cumulus clouds are puffy or lumpy clouds whose name comes from the Latin word for 'heap.' They are typically

detached from each other and associated with sunny weather. They are the most common type of low-level cloud. They typically form during the daytime when sunlight heats the ground, which then heats up the air above it.

Stratus clouds are also low-level clouds often given the descriptive name, 'high fogs,' since they resemble fog except that they do not reach the ground. The Latin term 'stratus' means 'layer' and these clouds typically cover an entire sky and completely block out the sun, thus forming 'gray days.'

Stratocumulus clouds are low-level clouds that indicate that worse weather is on the way or just clearing. Their presence generally limits the range in temperature between daytime and nighttime. Stratocumulus clouds are associated with cool, damp weather.

The cloud name 'Cirrus' is derived from the Latin term meaning 'curl of hair.' These clouds are described as thin and wispy—almost feathery, with curled up ends. They are commonly known as "Mare's tails" because of their appearance and accompany fair weather. These clouds are often associated with optical effects



A painting showing Cirrus clouds

such as halos and sun dogs. Cirrus clouds are the most common of the high-level clouds.

Cirrocumulus clouds are also high-level clouds associated with fair but cold weather. They are typically wave-like in appearance and can resemble ripple marks left in the sand. Sometimes they can look like scales on a fish and thus the nickname, "Mackerel-sky."

Lastly, Cirrostratus clouds are often nicknamed, "bed sheet" clouds because they are semi-transparent and often cover the entire sky. They are made of ice crystals, as are all the high-level cloud types.

For more helpful hints see Lin's (S'COOL director) tips for cloud observations at: <http://asd-www.larc.nasa.gov/SCOOL/lintips.html>

NASA STEM

NASA Science Trivia
to Excite & Motivate Students

Well, we're pretty sure that you know what a meteorologist is but did you know that animals can sometimes be better forecasters of weather? That's right! Did you know that a cow with its tail to the west is a forecaster of fair weather; and a cow with its tail to the east is a forecaster of possible rainy weather ahead? Did you know that crickets can forecast the temperature? The chirping of a cricket has been shown to provide the air temperature within one degree 75% of the time. The temperature is equal to the number of chirps in 14 seconds plus 40. For more weather proverbs visit: <http://www.wxduke.com/proverb.html>

The Winners of S'COOL's 3rd Cloud Photo Contest

S'COOL received several photos for our third photo contest. We are truly enjoying the competitions and we will have yet another cloud photo contest. The highlight of this **4th Cloud Photo Contest** will be **Optical Effects** such as Sun Dogs, Halos and Sun Pillars. For examples of each we recommend a search on the Internet. 1st, 2nd and 3rd place winners will be announced on our website and in the March newsletter. You may send us photos developed from any film type or send us a digital picture of your entry. We will accept photos throughout the entire month of January. Be sure to include your school, teacher name and photographer's first name (if a student) on photos submitted. Photos sent will become the property of NASA and will not be returned.

FIRST PLACE WINNERS of S'COOL's 3rd Photo Contest are:

Cirrocumulus: Ingomar Middle School; Pittsburgh, PA
AltoCumulus: Taipei Municipal Girls HS; Taipei, Taiwan
Cumulus: Rock Island High School; Rock Island, IL



For a list of all winners and their winning photos please visit our website at: <http://scool.larc.nasa>

Teacher Corner

Over 1615 participants are now registered.
Keep spreading the word!

Have you changed your school information? Please remember to notify us of any changes in your school information, e-mail address or anything you feel is important for our database.

New Student Resource - Student bookmark!!!

The S'COOL team is proud to present the new student bookmark available for printing from our website at: <http://asd-www.larc.nasa.gov/SCOOL/bookmarks.html>
Black and White version is available upon request.

S'COOL Teachers Share Ideas

Check out the great lesson ideas at: http://asd-www.larc.nasa.gov/SCOOL/teacher_share.html
Join us by sending us your lesson ideas!

Intensive Observation Period - January 12-16

Thank you for your continued participation!

NASA Langley Research Center
CERES S'COOL Project
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Upcoming Events

American Geophysical Union
December 8-12, 2003
San Francisco, CA USA

GLOBE Meeting
January 26-28, 2004
Boulder, CO USA

IOP—Intensive Observation Period
January 12-16, 2004
World-wide

<http://asd-www.larc.nasa.gov/SCOOL/visits.html>

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Roberto Sepulveda, Spanish translator

“Stop the car! It’s a contrail!”

"Our family trips to my hometown now include stopping to photograph contrails, and to notice for how many miles we can see the same contrail. I now have everyone in the family pointing out great contrails!"

Susan Moore, retired teacher, Menchville High School; Newport News, Virginia